CLAIMS

1. An optical processing apparatus for processing a plurality of optical carriers of a wavelength division multiplexed signal, comprising:

a reflective diffracting optical element having a plurality of grating elements forming a plurality of pixels, each pixel configurable to direct a corresponding one of the plurality of optical carriers along a main pathway;

an optical source located off the main pathway, positioned to direct an optical carrier to be added onto one of the plurality of pixels of grating elements, the one of the plurality of pixels configurable to diffract at least a portion of the optical carrier to be added into the main pathway; and

a controller coupled to the reflective diffracting optical element to configure the plurality of pixels.

2. The optical processing apparatus of claim 1 further comprising a substrate, and a plurality of actuating beams supported over the substrate, each of the plurality of actuating beams supporting a corresponding one of the grating elements over the substrate and forming an auxiliary gap, the plurality of actuating beams and the plurality of grating elements configured such that a displacement of at least one of the plurality of actuating beams toward the substrate causes the corresponding one of the reflective grating elements to be displaced toward the substrate.

3. The optical processing apparatus of claim 1 wherein the optical source is an optical fiber.

4. The optical processing apparatus of claim 1 wherein the portion of the optical carrier to be added is a first order diffraction of the optical carrier to be added.

5. The optical processing apparatus of claim 1 further comprising a demultiplexer optically coupled to the reflective diffracting optical element to achieve spatial separation of the plurality of optical carriers and to project the plurality of optical carriers onto the plurality of pixels of the reflective diffracting optical element.

6. An optical processor, comprising:

a reflective diffracting optical element configurable to diffract a first optical carrier along a main pathway, the diffracting optical element having a plurality of parallel grating elements, adjacent grating elements of said plurality of grating elements separated by a corresponding one of a plurality of gaps, the plurality of gaps diffracting a portion of the first optical carrier at an angle to the main pathway; and

a first detector positioned to receive the portion of the first optical carrier.

7. The optical processing apparatus of claim 6 further comprising an optical element to direct the portion of the first optical carrier to the first detector.

8. The optical processing apparatus of claim 6 wherein the plurality of gaps diffracts a portion of a second optical carrier.

9. The optical processing apparatus of claim 8 further comprising a dispersive optical element positioned to receive the portion of the first optical carrier and the portion of the second optical carrier from the reflective diffracting optical element, and to increase spatial separation between the portion of the first optical carrier and the portion of the second optical carrier, the dispersive optical element directing the portion of the first optical carrier to the first detector.

10. The optical processing apparatus of claim 8 further comprising a second detector positioned to receive the portion of the second optical carrier.

11. The optical processing apparatus of claim 8 further comprising an actuator to sequentially direct the portion of the first optical carrier and the portion of the second optical carrier to the first detector.

12. A method of adding an optical carrier to a wavelength-division multiplexed signal using a diffracting optical element, the diffracting optical element having a plurality of grating elements forming a plurality of pixels, each pixel configurable to direct a corresponding one of a plurality of optical carriers along a main pathway, comprising:

directing the optical carrier from a location off of the main pathway onto one of the plurality of pixels; and

configuring the one of the plurality of pixels to diffract at least a portion of the optical carrier into the main pathway.

13. The method of claim 12 wherein the diffracting optical element includes a plurality of actuating beams, each of the plurality of actuating beams supported over a substrate and supporting a corresponding one the grating elements over the substrate, the plurality of actuating beams and the plurality of grating elements configured such that a displacement of at least one of the plurality of actuating beams toward the substrate causes the corresponding one of the reflective grating elements to be displaced toward the substrate.

14. The method of claim 12 wherein configuring the one of the plurality of pixels is achieved by actuating at least one of the plurality of actuating beams.